Divelbiss CORPORATION

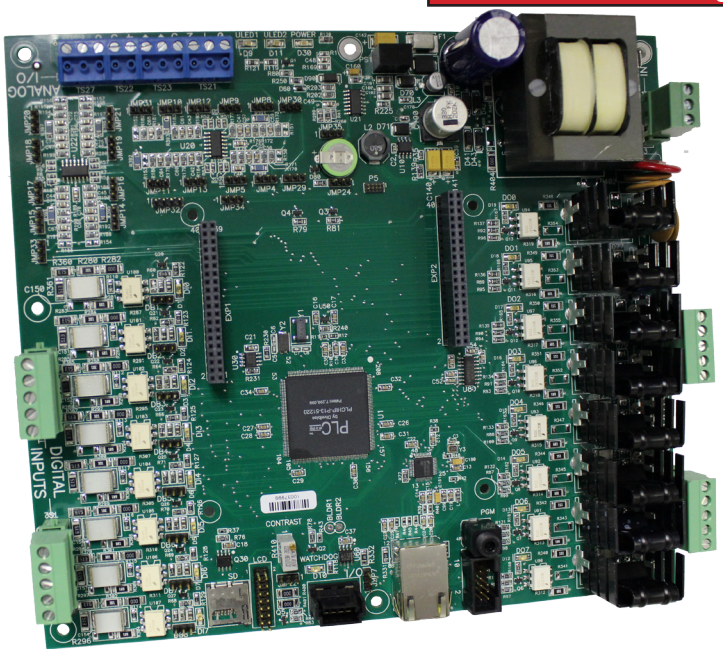
P-SERIES BEAR BONES

Open-Board Controllers, I/O and Add-ons

PLC on a chip Embedded

Supports J1939 & NMEA 2000 Networking

- AC / DC Power and I/O Models
- 8 Digital Inputs - Isolated
- 8 Digital Outputs - Isolated
- Expandable Digital I/O
- 12-bit Analog Inputs
- 10-bit Analog Output
- Visual Status Indicators (LED)
- Structured Text Support
- Quick Disconnect Field Connections
- Programs with EZ LADDER Toolkit
- Ethernet using Modbus TCP
- Real Time Clock
- LCD Display & Keypad Support
- -40°C to 80°C Operating Temperature
- SD Card Support
- Supports J1939, NMEA 2000 & OptiCAN



P-Series Bear Bones Controller

The P-Series Bear Bones consists of open-board Controllers, I/O Expanders and Specialty Expanders. The P-Series Bear Bones provides powerful control features that include analog and digital I/O, CAN network communication via OptiCAN, Ethernet Modbus TCP, LCD Display and Keypad. Based on the second generation of PLC on a Chip™, the controllers are easy to program using Divelbiss EZ LADDER Toolkit PC based software. The Controllers are available with AC or DC power and I/O.

The P-Series Bear Bones digital I/O capabilities may be expanded by plug-in I/O Expanders. Each I/O Expander provides another 8 digital inputs and 8 digital outputs and are available with AC or DC I/O. Up to 31 I/O Expanders may be connected and addressed to one controller.

The P-Series Bear Bones Controller's footprint is identical to the original Bear Bones making the P-Series Bear Bones controller a mechanical drop-in replacement. The P-Series Bear Bones I/O Expander's footprint is identical to the original Bear Bones I/O Expander making the P-Series Bear Bones I/O Expander a mechanical drop-in replacement. Being mechanically the same, the P-Series Bear Bones Controller and I/O Expander allow for powerful and easy hardware upgrades to equipment using the original Bear Bones.

Typical Applications Include:

- Material Handling
- Machine Control
- Remote Locations Monitoring & Control
- Engine Driven Pumps, Compressors & Generators

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Models:

MODEL	DESCRIPTION
ICM-BB-P13-30	P-Series Bear Bones Controller with all features, 8-32VDC Input Power and I/O
ICM-BB-P13-40	P-Series Bear Bones Controller with all features, 90-130VAC Input Power and I/O
ICM-IO-C21	P-Series Bear Bones I/O Expander with 8-32VDC I/O
ICM-IO-C24	P-Series Bear Bones I/O Expander with 90-130VAC I/O
ICM-PUI-01	Specialty Expander, Operates as the original ICM-TM-01, TM-02 or TM-03 (uses EXP1/EXP2 ports)

Specifications:

P-Series Bear Bones Controllers		
	ICM-BB-P13-30	ICM-BB-P13-40
Flash Memory	512K Total / >229K Bytes Available to User	512K Total / >229K Bytes Available to User
EEPROM Memory	4K Bytes	4K Bytes
RAM Memory	32K Bytes	32K Bytes
SD Card	1 Micro SD Card Socket	1 Micro SD Card Socket
Serial Ports	1 Programming Port (uses SI-PGM)	1 Programming Port (uses SI-PGM)
Ethernet Ports	1 Port, RJ45 Connection	1 Port, RJ45 Connection
CAN Ports	1 Port, 4 Pin 3M Link (Used for I/O Expanders)	1 Port, 4 Pin 3M Link (Used for I/O Expanders)
Networking	J1939, NMEA 2000, OptiCAN (CAN), Modbus TCP (Ethernet)	J1939, NMEA 2000, OptiCAN (CAN), Modbus TCP (Ethernet)
Digital Inputs	Qty 8. 8-32VDC, Sink/Source in groups of four. Optically Isolated	Qty 8. 90-130VAC, Sink/Source in groups of 4 Optically Isolated
Digital Outputs	Qty 8. 8-32VDC, Sink in groups of four. 2 Amps per point. Optically Isolated.	Qty 8. 90-130VAC, Sink/Source in groups of four. 2 Amps per point. Optically Isolated.
LED Indicators	Input (8), Output (8), Power, Watchdog, User Programmable (2)	Input (8), Output (8), Power, Watchdog, User Programmable (2)
Analog Inputs	Qty 8*. Range 0-5VDC, 0-10VDC or 0-20mADC - Jumper Configured. 12-bit Resolution	Qty 8*. Range 0-5VDC, 0-10VDC or 0-20mADC - Jumper Configured. 12-bit Resolution
Analog Outputs	Qty 1**. Range 0-5VDC or 0-10VDC - Jumper Configured.	Qty 1**. Range 0-5VDC or 0-10VDC - Jumper Configured.
Real Time Clock	Time of Day, Day, Month, Year and Day of Week	Time of Day, Day, Month, Year and Day of Week
Input Power	8-32VDC / 44mA @ 24VDC Input (no loads). On-board polyfuse protection (DC supply)	90-130VAC / 27mA @ 120VAC Input (no loads). On-board polyfuse protection (DC supply), field replaceable glass fuse (AC Input Power).
LCD Display	Supports 1-4 Rows, 8-40 Columns. On-board Contrast adjustment. On-board backlight control (via ladder diagram). Uses 16 pin ribbon connection.	Supports 1-4 Rows, 8-40 Columns. On-board Contrast adjustment. On-board backlight control (via ladder diagram). Uses 16 pin Ribbon connection.
Keypad	Supports 4 Row x 5 Columns, Scanned. Uses 10 pin ribbon connection.	Supports 4 Row x 5 Columns, Scanned. Uses 10 pin ribbon connection.
Expandable	Accepts I/O P-Series Bear Bones I/O Expanders (I/O Port) and Specialty Expanders (Exp1 & Exp2)	Accepts I/O P-Series Bear Bones I/O Expanders (I/O Port) and Specialty Expanders (Exp1 & Exp2)
Operating Temperature	-40°C to +80°C	-40°C to +80°C
Programming Language	Ladder Diagram with function blocks and Structured Text using EZ LADDER Toolkit	Ladder Diagram with function blocks and Structured Text using EZ LADDER Toolkit
Mounting	Standoffs and screws.	Standoffs and screws.
Size	9.0” x 8.0” x 1.5” (no plug-in expansion installed)	9.0” x 8.0” x 1.5” (no plug-in expansion installed)

* Qty 8 if not using Analog Output.
** Uses 1 Analog Input.

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P-Series Bear Bones I/O Expanders		
	ICM-IO-C24	**ICM-IO-C21**
CAN Ports	1 Port, 2 Connectors - 4 Pin 3M Link (Connects to I/O or Controller)	1 Port, 2 Connectors - 4 Pin 3M Link (Connects to I/O or Controller)
Digital Inputs	Qty 8. 8-32VDC, Sink/Source in groups of four. Optically Isolated	Qty 8. 90-130VAC, Sink/Source in groups of 4 Optically Isolated
Digital Outputs	Qty 8. 8-32VDC, Sink in groups of four. 2 Amps per point. Optically Isolated.	Qty 8. 90-130VAC, Sink/Source in groups of four. 2 Amps per point. Optically Isolated.
LED Indicators	Input (8), Output (8), Power, Watchdog	Input (8), Output (8), Power, Watchdog
Input Power	8-32VDC / 13mA @ 24VDC Input from Controller (no loads)	8-32VDC / 13mA @ 24VDC Input from Controller (no loads)
Expandable	Allows for daisy chaining additional I/O Expanders.	Allows for daisy chaining additional I/O Expanders.
Operating Temperature	-40°C to +80°C	-40°C to +80°C
Programming Language	None. Controlled from P-Series Bear Bones Controller Program.	None. Controlled from P-Series Bear Bones Controller Program.
Mounting	Standoffs and screws.	Standoffs and screws.
Size	9.0” x 5.4” x 1.5”	9.0” x 5.4” x 1.5”

Programming the Controller:

The P-Series Bear Bones Controllers program in Ladder Diagram using Divelbiss EZ Ladder Toolkit, a Ladder Diagram Development Platform. EZ Ladder software parallels the IEC-61131 standard and provides an easy to use interface.

After a ladder diagram program is developed, it can be downloaded to the P-Series Bear Bones controller via the serial port or Ethernet Port. The program is stored on non-volatile FLASH memory and is automatically executed on power up. Once the download is complete, the controller is successfully programmed and begins executing the program. The P-Series Bear Bones Controllers supports the use of Structured Text.

Refer to the EZ Ladder User’s Manual for more detail on creating ladder diagram programs, connecting to targets and downloading the program to targets. The manual can be downloaded from our website: http://www.divelbiss.com The Programming port requires a programming cable, part number SI-PGM (sold separately).

Digital Inputs:

There are 8 digital inputs standard on the P-Series Bear Bones controllers. All inputs will operate from 8-32VDC or 90-130VAC (model dependent) and are divided into 2 groups of 4 inputs. All inputs support sinking and sourcing per input group based on wiring configuration. The digital inputs are accessed in the ladder program by the use of contacts and boolean variables.

Digital Outputs:

There are 8 digital outputs standard on the P-Series Bear Bones controllers. All outputs will operate from 8-32VDC and can sink or source (AC Models) or sink (DC Models) up to 2 Amps each. These 8 digital outputs are divided into 2 groups of 4. Each group of 4 outputs may be wired individually as sinking or sourcing. All the digital outputs operate as digital outputs (Off / On operation).

Ethernet:

An Ethernet port is available on supported P-Series Bear Bones models. The Ethernet port is accessible via an industry standard RJ45 connection and auto detects the cable type. The P-Series Bear Bones controller’s Ethernet port may be used to program the controller or it may be configured and used as a Modbus Master or Modbus Slave (Modbus TCP). This port may be field configured with multiple options and supports fixed as well as dynamic IP addressing (DHCP).

SD Memory:

An industry standard Micro SD memory card may be installed on the P-Series Bear Bones controllers. A Micro SD plug-in socket is standard to each controller. This card is currently used for installing or updating ladder programs or controller kernel files. Future expansion will include data-logging to this SD Card memory.

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I/O Port - CAN Network Communications / I/O Expansion:

The P-Series Bear Bones controllers' CAN Ports support Divelbiss OptiCAN. Divelbiss OptiCAN is a proprietary register based CAN network that allows controllers, I/O modules and HMI devices to communicate to each other. OptiCAN utilizes the on-board CAN network port (I/O) on the P-Series Bear Bones controllers.

OptiCAN supports up to 64 devices and each device supports up to 256 network registers. Register transmission may be based on time or triggered by an event. The OptiCAN network provides function blocks for controlling the network and network status.

The CAN Network Port (I/O) is the expansion port for all P-Series Bear Bones I/O Expanders. Expanders connected to the I/O port utilize the OptiCAN network communications. This port supports up to 31 I/O Expanders and can accept a total of 64 devices.

The on-board I/O-CAN Network port supports J1939 and NMEA 2000 networking. Refer to the P-Series EZ LADDER Toolkit Manual for details on using and implementing these networks.

FRAM Retentive Memory / EEPROM Memory:

The P-Series Bear Bones controllers utilize FRAM technology for retentive variables in the user program. Variables declared as retentive, are automatically stored into the FRAM memory when a loss of power is detected and then reloaded automatically when power is restored. In addition to retentive variables, other variables in the user program may be stored into and recalled as needed from FRAM memory by using the EEPROM_READ and EEPROM_WRITE function blocks. The P-Series Bear Bones controllers provide a total of 480 bytes of FRAM that may be divided into retentive variable storage and EEPROM type storage using EZ LADDER Toolkit.

In addition to FRAM, the PLC on a Chip™ also supports internal EEPROM memory that may be utilized in the ladder diagram by the EEPROM_READ and EEPROM_WRITE function blocks.

Real Time Clock:

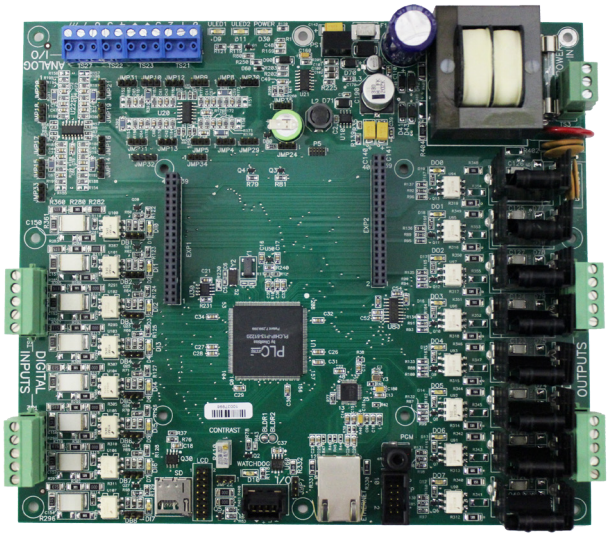
The P-Series Bear Bones controllers allow for the use of real time in the user programs with the inclusion of a real time clock. The on-board real time clock allows the user and user program to read and set the current date and time as required by the application. The real time clock supports the month, day, year and day of week for date functions and hour, minute and seconds for time functions. The real time clock is maintained by an internal lithium battery and is enabled internally by a jumper.

Legacy & Add-ons:

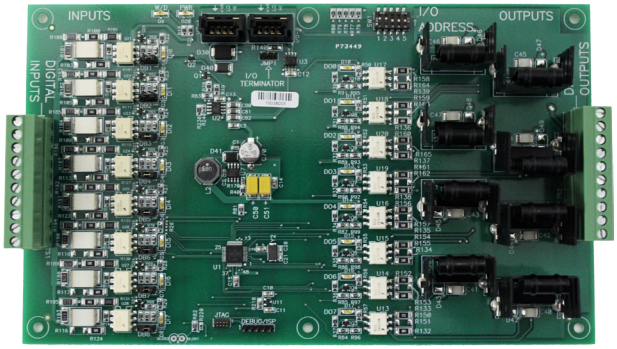
The P-Series Bear Bones controllers and I/O are designed to fit physically into the same mounting and footprint as the original Bear Bones controllers and expanders providing an upgrade path for current Bear Bones users that wish to increase features and functionality.

In addition to I/O expansion, the P-Series Bear Bones allows additional expansion via on-board EXP connections. The ICM-PUI-01 plugs into the expansion ports and the card will operate as the original Bear Bones timer card for legacy timer support.

ICM-BB-P13-40



ICM-IO-C21



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